THE GENUS CHAITOPHORUS KOCH IN NORTH AMERICA (HOMOPTERA, APHIDIDAE)

BY

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Introduction

A number of samples of *Chaitophorus* which I collected in Quebec, New Brunswick, Maine and Colorado had to be identified and this lead to a more general study of the species from North America. Dr. F. C. Hottes and Professor G. F. Knowlton at my request collected many samples from willows and poplars, and, with Professor E. O. Essig, Dr. L. G. Strom, Dr. H. H. Ross, Dr. G. H. Simpson, Professor M. A. Palmer, Professor A. N. Tissot, Dr. J. O. Pepper, Miss L. M. Russell and Mrs. M. E. MacGillivray, provided me with type material and other valuable specimens. As a result a complete collection of American *Chaitophorus* species is available for comparison with the European and Asiatic species.

The sclerotisation and surface structure of the integumentum are very useful for the identification of species of this genus. Therefore specimens in balsam had to be cleared and remounted with the technique which I described in 1958. New born larvae or embryones were generally studied. Particular attention was given to the very conspicuous variation in the pigmentation of apterae viviparae, a phenomenon which is known from some European species, but which seems to be much more common in American members of the genus.

Classification

The name *Chaitophorus* Koch, 1854 is maintained here in its customary sense, pending a decision to make it a nomen conservandum. Koch indicated no type, but Gerstaecker (1856) chose as type *Aphis populi* L. But Koch (1854) did not describe *Aphis populi* L. (syn. *Asiphum tremulae* De Geer), but *Aphis populeti* Pz., 1805, under the name *Chaitophorus populi* L.; therefore the true *Aphis populi* L. is not among the species included by Koch, and consequently Gerstaecker's selection of a type is invalid. Passerini (1860) who was not familiar with Gerstaecker's paper selected *Aphis aceris* F. as type, which would result in *Chaitophorus* replacing *Periphyllus* v. d. Hoeven, 1863, which also would be very upsetting. Therefore Hille Ris Lambers & Stroyan have asked the International Committee on Zoological Nomenclature to use its plenary powers, and to declare as valid the type fixation by Van der Goot (1913) who selected *Chaitophorus leucomelas* Koch, 1854. Also in another way the name *Chaitophorus* Koch has been threatened. In 1931 Börner began correcting the latin transcription

of Greek aphid names, even without taking into account transcriptions known from the classics. So instead of *Chaitophorus* Koch, BÖRNER (1931 and later) wrote *Chaetophorus* Koch. Although BÖRNER maintained his "corrections" till the end, he in 1952 returned to the spelling *Chaitophorus,* perhaps because he had found out that otherwise the name would have to be rejected as a junior homonym of *Chaetophorus* Kirby, 1828.

Some species have since some time been placed in other genera. WILSON (1910) erected *Thomasia* for *Chaitophorus populicola* Thos., 1878. BAKER (1920) discovered that *Thomasia* Wilson was preoccupied and proposed *Neothomasia* as new name, but Dr. J. P. DONCASTER pointed out to me that earlier STRAND (1917) had proposed *Thomasiniellula* as a new name for *Thomasia* Wilson. Lately American authors referred *Thomasiniellula* species to the genus *Periphyllus* v. d. Hoeven, because of the rounded, not knobbed cauda.

Though the shape of the cauda is not very helpful in the classification of this group, the *Acer*-infesting *Periphyllus* can easily be separated from the *Salix*-and-*Populus* infesting *Chaitophorus* by the spinulosity of the hind tibiae in (alate) *Periphyllus*; in *Chaitophorus* in its widest sense the hind tibiae only at their very apices have some spinules between the hairs.

Chaitophorus as understood in this paper is very heterogeneous, like all larger genera. BÖRNER (1949, 1952) and BÖRNER & HEINZE (1957) have divided it into many genera with apparently the general idea to get species from willows into other genera than species from poplars. The result is most unsatisfactory, partly because species from outside Europe although mentioned, yet evidently were not studied. BÖRNER's classification should be discussed in its latest version in BÖRNER & HEINZE (1957). He recognizes:

(1). *Chaitophorus* Koch, 1854, and states that GERSTAECKER (1856) chose *Aphis populi* Koch as type, which is wrong because GERSTAECKER indicated *Aphis populi* L. as type. KOCH's *Chaitophorus populi* is *populeti* Pz. and so BÖRNER in his *Chaitophorus* unites species with in apterae viviparae abd. tergites I—VII fused, with a fairly long processus terminalis and with pseudosensoria on the hind tibiae in viviparae. Such species are only known from the Palaearctic region.

(2). *Allarctaphis* Börner, 1949, type *Chaitophorus nassonowi* Mordv., 1895. Differs from *Chaitophorus* in BÖRNER's sense only by its short processus terminalis and therefore can safely be rejected.

(3). *Promicrella* Börner, 1949, type *Promicrella ramicola* Börner. Apterae with separate sclerotic bars on the abdomen. The type species varies so much in this respect that in the progeny of one specimen the abdomen may have a solid shield from abd. tergites I—VI, or separate bars on each tergite. Fundatrices of some species (*Ch. lapponum* Oss.) have free sclerotic bars, the next generation a compact shield. The genus cannot be maintained.

(4). *Micrella* Essig, 1912, type *Micrella monelli* Essig, 1912, is distinguished because its siphunculi are said (e.g. ESSIG, 1912) to be not reticulated, and the cauda is not knobbed. The siphunculi, however, are distinctly reticulated and the shape of the cauda is of no use (vide sub *Chaitophorus salicicola* Essig, p. 21).

(5). *Pseudomicrella* Börner, 1949, type *Aphis vitellinae* Schrank, 1801. Apterae with abd. tergites I—VI fused, alatae with separate transverse bars on the ab-

domen. As is discussed sub *Chaitophorus nigrae tranaphoides* subsp. nov. on p. 16, the VIIth tergite being free or not is rather a subspecific or specific character than a generic character; the bars on the abdomen are within many species so variable that they may be thin and mutually free, or very broad, joining to a compact central sclerite. The genus can be rejected.

(6). *Eichochaitophorus* Essig, 1912, type *Eichochaitophorus populifolii* Essig, 1912, is according to Börner like the preceding, but alatae are said to have a solid patch on the abdomen. This to some extent holds for European species that Börner (1952) includes, but unfortunately not for the typus generis which in cleared alatae appears to have free abdominal bars.

(7). *Tranaphis* Wlk., 1870, type *Aphis salicivora* Wlk., 1848 (= *Aphis capreae* Mosley, 1841) has abdominal tergites I—VII fused in apterae viviparae. I doubt whether even in the typus generis this character is constant (vide p. 16) and see no further reason for accepting this genus.

Börner also uses the shape of the apices of the dorsal hairs in apterae, a character which appears to be extremely unreliable in American *Chaitophorus*, and writes that in *Tranaphis* Wlk. (very small species) first instar larvae have two pleural hairs, in his other genera (larger species) four pleural hairs.

Summarizing Börner's division it appears that he managed to get European *Chaitophorus* from *Salix* into other genera than those from *Populus*, but the division is open to criticism and it collapses entirely if American or Japanese species are considered as well.

The shape of the cauda in *populicola* Thos., rounded and very much shorter than wide, is very different from that in species like *stevensis* Sanborn in which it is as long as its basal width and markedly knobbed. But species like *salicicola* Essig and *nigrae* Oestlund show clearly that there is no sharp distinction in caudal shape and for that reason *Thomasiniellula* Strand, 1917, is not accepted here, not even as a subgenus.

Perhaps the species *abditus* Hottes, *knowltoni* spec. nov., *macrostachyae* Essig, and *salicicorticis* Essig might be placed in a separate subgenus. These species are unusually hairy, and also the first instar larvae have many more hairs than other species, e.g., 4—7 pairs of marginal hairs on each tergite, instead of one pair as usual. But *utahensis* Knowlton which is similar, but even more resembles *populicola* Thos., as first instar larva has only two pairs of marginal hairs on each abd. tergite and as the mentioned species are large, this character would seem to be worthless.

The following species are discussed here as *Chaitophorus* spp.

Neothomasia abditus Hottes, 1926; *Chaitophorus bruneri* Williams, 1911; *Chaitophorus cordatae* Williams, 1911; *Thomasia crucis* Essig, 1912; *Chaitophorus delicata* Patch, 1913; *Chaitophorus essigi* Gillette & Palmer, 1928; *Chaitophorus knowltoni* spec. nov.; *Chaitophorus longipes* Tissot, 1932; *Symdobius macrostachyae* Essig, 1912; *Micrella monelli* Essig, 1912; *Chaitophorus neglectus* Hottes & Frison, 1931; *Sipha minuta* Tissot, 1932; *Chaitophorus nigrae* Oestlund, 1886; *Chaitophorus populella* Gillette & Palmer, 1928; *Chaitophorus populicola* Thos., 1878; *Chaitophorus populifoliae* Oestlund, 1887; *Eichochaitophorus populifolii* Essig, 1912; *Chaitophorus pusillus* Hottes & Frison, 1931; *Chaitophorus pustulatus* spec. nov.; *Chaitophorus salicicola* Essig, 1911; *Neothomasia saliciniger* Knowl-

ton, 1927; *Symdobius salicicorticis* Essig, 1912; *Chaitophorus salicti* Williams, 1911; *Chaitophorus stevensis* Sanborn, 1904; *Neothomasia utahensis* Knowlton, 1928; *Chaitophorus versicolor* Koch, 1854; *Chaitophorus viminalis* Monell, 1879; *Chaitophorus viminicola* spec. nov.

Geographical distribution

The geographical distribution of most species is little known. One species, *Ch. versicolor* Koch, occurs in Europe and North America and has almost certainly been introduced into America. In Europe *Ch. populifolii* (Essig) has been found on balsam poplar in Germany, most probably introduced with cuttings from North America. Some of the species occur all over the continent, and these show a tendency to subspecific differentiation. There is a certain system in this in so far that samples from the South and West usually have blunt or furcated hairs while Eastern and Northern samples show acute hairs, within the same species. In some such cases, where there was quite clearly no question of seasonal variation, I have applied subspecific names.

Notes on morphology

Some morphological characters used in this paper are not familiar to American readers and therefore require explanation. In apterae viviparae the abdominal tergites usually partly fused. As a maximum abd. tergites I—VII are covered by a solid sclerotic shield, as a minimum all tergites are mutually free. The first tarsal joints in adults bear near their distal ventral margin 5 hairs of which the middle one is very much shorter than the lateral ones; more basad many species have 1—2, rarely 3 additional hairs on those joints. Species in which 6—7 hairs on the first tarsal joints are normal, may have summer dwarfs with 5 hairs on the first tarsal joints. Species with normally 5 hairs on the first tarsal joints may in some specimens show one or two legs with 6 hairs.

Where no special morph is indicated the characters in the key and the descriptions relate to apterae viviparae. When characters of other morphs are mentioned this is explicitly stated. Oviparae and fundatrices have not been discussed in detail. In oviparae the body is usually more elongated, the dorsum is never strongly sclerotic and the hind tibiae bear pseudosensoria and usually are swollen. Fundatrices usually look like their offspring but their antennae are always comparatively shorter, particularly the processus terminalis.

Key to american *Chaitophorus*

1 (22) Cauda in all morphs without a trace of constriction*), with about parallel sides to arc-shaped. First tarsal joints with usually 7 hairs, rarely 5 hairs (*Chaitophorus crucis* Essig, *Ch. monelli* (Essig)).

2 (5) Cauda truncated conical, conspicuously blunt, about $^2/_3$ times as long as its basal width, with rather straight sides.

*) In case of doubt vide sub *Chaitophorus salicicola* Essig, p. 21 or *Ch. monelli* (Essig), p. 14.

3 (4) Tergum at least on the pleural regions of the thorax with a reticulation composed of rather acute nodules. Last rostral segment beak-like, not much shorter than second joint of hind tarsi. Tibiae about smooth. On *Salix*. California, Utah, Colorado, Minnesota ..... *Ch. salicicola* Essig, p. 21

4 (3) Tergum smooth with scattered, quite blunt nodules almost only on the front and the middle of the thorax. Last rostral segment blunt, only about $^2/_3$ of second joint of hind tarsi. Tibiae with rather distinct spinulose imbrications on distal part. On *Salix*. California .... *Ch. monelli* (Essig), p. 14

5 (2) Cauda arc-shaped, rounded, very much less than $^2/_3$ times as long as its width at base, its sides rounded.

6 (13) Basal part of last antennal segment with 7—14 hairs. Head dorsally with 35 or more hairs. Processus terminalis not longer than base of VIth antennal segment. Usually a few hairs on the base of the siphunculi. Dorsum reticulated.

7 (10) Abd. tergites I—VI with free marginal sclerites, also often with free spinal sclerotic bars, and with numerous small scleroites bearing hairs.

8 (9) IIIrd and usually IVth ant. segment on distal portion with some rhinaria. Dorsal hairs acute. On bark of *Salix*, near or below soil level. Utah. *Ch. knowltoni* spec. nov., p. 11

9 (8) IIIrd and IVth ant. segment normally without rhinaria. Dorsal hairs all or partly blunt, with incised apices. On bark of *Salix*, near or below soil level. Utah, Minnesota, Colorado ..... *Ch. abditus* (Hottes), p. 9

10 (7) Abd. tergites I—IV completely sclerotic, tergites II—VII or III—VII usually completely fused to a shield.

11 (12) Longest hairs on vertex about 0.085—0.105 mm long. On bark of *Salix*. California. ..... *Ch. salicicorticis* (Essig), p. 23

12 (11) Longest hairs on vertex about 0.045—0.070 mm long. On bark of *Salix*. California. ..... *Ch. macrostachyae* (Essig), p. 13

13 (6) Basal part of last antennal segment with 2—5, rarely 5—9 hairs, but then the head dorsally with at most 30 hairs. Processus terminalis normally longer than base of VIth segment. Dorsum sometimes smooth.

14 (15) Neither the dark sclerotic pronotum, nor the dark abd. sclerites II—VI with paler median line, but the metanotum and Ist abd. tergite partly or completely much paler (use pocket lens!). Hind tibiae black, in not too black specimens darker than any other part of the legs. On various *Populus* spp. ..... *Ch. populicola* Thos. sensu latiore, p. 17

a (b) Part or most of the dorsal hairs on abdomen acuminate, blunt or with chisel-shaped, often furcate apices. On various *Populus* spp. .... *Ch. populicola* Thos. sensu stricto

b (a) All hairs fine and acute.
Processus terminalis 1—1½ times as long as base of VIth segment, the latter with rarely more than 5 hairs. On shoots or bark of *Populus tremuloides*. Colorado, North-East America .... *Ch. populicola* Thos. *patchae* subsp. nov.

15 (14) Abdominal shield always with more or less sharply bordered longer or shorter paler median stripe or line (use pocket lens!). Hind femora

generally darker than the middle portion of the hind tibiae.

16 (17) Tergum conspicuously covered with nodules, nowhere reticulated, marginally, except usually at the mesonotum to Ist abd. segment, dark or darkened, pale along a broad band down the dorsum, often from head to tail, and this pale area often laterally extended on most of the hind half of the thorax and the anterior abd. tergites. Last rostral segment rather acute, with two hairs besides the three pairs near apex (of which one pair is placed rather far basad). On *Salix*. Utah, Wyoming, Colorado ..... *Ch. pustulatus* spec. nov., p. 20

17 (16) Tergum marginally often with nodules, but dorsally at least regionally with distinct reticulation; dorsum either rather uniformly dark or with a spindle-shaped sharply bordered paler area and laterally completely dark.

18 (19) VIIth abd. tergite usually completely fused with tergites I—VI, only the VIIIth tergite free; sometimes spinally some membraneous perforations between tergites VI and VII and I and II. Pigmentation of body rather uniformly mottled dark, with macroscopically a vague paler band from head to tail. Hind femora much darker than dorsum. Last rostral segment with about 8—10 hairs besides the 3 pairs near apex. On *Salix*. Utah, Colorado. ..... *Ch. utahensis* (Knowlton), p. 25

19 (18) VIIth abd. tergite either quite free or only laterally indistinctly fused with VIth abd. tergite. Body either rather pale or dark with a sharply bordered pale spindle-shaped area in the middle. Hind femora at most as dark as dorsum. Last rostral segment with not more than 4 hairs besides the 3 pairs near apex.

20 (21) First tarsal joints with 7 hairs. Hairs on ant. segments III—VI all long and fine, spreading, up to $2\frac{1}{2}$ or 3 times as long as the diameter of the segment where they are placed; hairs on base of VIth segment up to $2\frac{1}{2}$ times diameter of the segment. On *Salix*. Utah. .... *Ch. saliciniger* (Knowlton), p. 22

21 (20) First tarsal joints with 5 hairs. Hairs on ant. segment III and usually also IV and V stiff, at acute angles, quite blunt; hairs on base of VIth segment inconspicuous, little longer than maximum diameter of the segment. On *Salix*. California. ..... *Ch. crucis* (Essig), p. 11

22 (1) Cauda in viviparous females and males distinctly constricted and so divided into a globular distal part and a triangular basal part. First tarsal joints with 5—7 hairs.

23 (32) First tarsal joints with 5 hairs, rarely with on one or two legs 6 hairs. On *Salix* (and *Populus alba*).

24 (25) Dorsum either distinctly reticulated or with rather acute spinules that at least locally (e.g., on the mesonotum) merge into distinct reticulations. Dorsum variably pigmented; at a minimum pale with pale brownish pleural intersegmental sclerites; often dark with a very broad pale median stripe from head to tail and pale margin; at a maximum quite black. Last rostral segment with 8 hairs, 0.9—1.3 times as long as second joint of hind tarsi. In alatae 9—17 rhinaria irregularly placed on IIIrd ant. segment and also IVth and often Vth segment with rhinaria. Pro-

cessus terminalis 2—3 times as long as base of last ant. segment, usually shorter than IIIrd ant. segment. On *Salix* leaves .... *Ch. nigrae* Oestl. sensu latiore, p. 15

a(b) Abd. tergite VII fused with tergites I—VI. Pennsylvania. .... *Ch. nigrae* Oestl. *tranaphoides* subsp. nov.

b(a) Abd. tergite VII free.

c(d) Dorsal hairs also on the thorax with long fine apices. Hairs on the outer side of IIIrd ant. segment usually very much longer than largest diameter of the segment, at least in early summer specimens. Minnesota, Nebraska, Maine; Ontario, New Brunswick (Canada) .... *Ch. nigrae* Oestl. sensu stricto

d(c) Dorsal hairs all or partly blunt, especially on the thorax, but sometimes even marginally on abdomen. Hairs on inner side of IIIrd ant. segment often not or hardly longer than largest diameter of the segment. Colorado, Utah. ..... *Ch. nigrae* Oestl. *nigrescens* subsp. nov.

25 (24) Dorsum never reticulated, at most with irregularly placed, quite blunt nodules. Last rostral segment with 8—14 hairs.

26 (29) Dorsal integumentum more or less completely blackish. Last rostral segment with 10 or more hairs. Hairs on inner side of IIIrd ant. segment not or hardly more than twice as long as longest hair on outer side of that segment.

27 (28) Dorsal hairs blunt, with furcated apices and even hairs on IIIrd ant. segment (often?) with enlarged incised apices. On *Salix*. Florida. ... . *Ch. longipes* Tissot, p. 13

28 (27) Dorsal and antennal hairs extremely long, with fine acute apices. On *Salix*. Pennsylvania, Iowa, Illinois. ..... *Ch. viminicola* spec. nov., p. 27

29 (26) Dorsal integumentum pale. Last rostral segment with 8 hairs. Hairs on inner side of IIIrd ant. segment many times as long as the inconspicuous hairs on outer side.

30 (31) Last rostral segment obtuse and short, conspicuously shorter than second joint of hind tarsi. On *Salix*. Illinois, Maine, Pennsylvania; New Brunswick, Quebec (Canada) ..... *Ch. pusillus* Hottes & Frison, p. 19

31 (30) Last rostral segment acute, distinctly longer than 2nd joint of hind tarsi*). On *Salix*. Florida, Louisiana ..... *Ch. minutus* (Tissot), p. 13

32 (23) First tarsal joint with 7 or on some legs 6 hairs, rarely in dwarfs with on one or two legs 5 hairs. On *Salix* or *Populus*.

33 (34) Siphunculi also in pale specimens dark, in dark specimens black, darker than the integumentum and not surrounded by a pale, membraneous area. Last rostral segment with 14—23 hairs. Alatae with more or less distinct ventral transverse striae on abdomen. On *Populus nigra* var. *italica, P. canadensis* and probably other *Populus* spp. Introduced from Europe and established. California; New Brunswick (Canada) .... *Ch. versicolor* Koch, p. 26

34 (33) Siphunculi usually pale, even if the integumentum is dark, but if pigmented, then surrounded by a pale, membraneous area. Last rostral

*) *Ch. populialbae* (Fonsc., 1841) has similar rostrum but ant. hairs little longer than diam. III. *Populus alba*. Introduced from Palaearctic. New Brunswick (Canada).

segment with 8—11 hairs. Alatae usually without dark ventral striae on abdomen.

35 (36) Dorsum brown pigmented with the sides of the abdomen and a median stripe pale, with all or nearly all the longest hairs with fine, acute apices, the spinal ones on IIIrd abd. tergite up to 0.120—0.150 mm long. On *Populus tremuloides*. Connecticut, Maine; New Brunswick (Canada) ... . *Ch. populifolii* (Essig) *simpsoni* subsp. nov., p. 19

36 (35) Dorsum often pigmented, but in that case longest hairs on IIIrd abd. tergite usually blunt or furcated and much shorter.

37 (38) Antennal hairs with fine, acute apices, the longest ones on inner side of IIIrd segment 3—4 times basal diameter of that segment, but those on outer side not longer than that diameter; longest hair on basal part of VIth ant. segment $^2/_3$—$^4/_5$ of the length of that part measured to the proximal rim of the rhinaria. On *Salix babylonica* and probably other *Salix* spp. Widely distributed in U.S.A. ... *Ch. viminalis* Monell, p. 27

38 (37) Antennal hairs often partly blunt and usually shorter than in the preceding, but if they are long, then the hairs on outer side longer than basal diameter of IIIrd ant. segment.

39 (40) Usually at least Ist ant. segment pigmented, but mostly also part of the head, thorax and abdomen dorsally dark, with nearly always the sides of the body pale. Alatae with the rhinaria on IIIrd ant. segment always in a straight, single row, with occasionally a rhinarium on IVth segment. On *Populus* spp. Widely distributed in U.S.A. and Canada. .... *Ch. populifolii* (Essig) sensu latiore, p. 18

a(b) All or nearly all dorsal hairs on body with thin, fine apices, with sometimes some of the longest hairs blunted; longest spinal hairs on IInd abd. tergite 0.120—0.150 mm long. Hairs on IIIrd abd. segment fine, acute, 2¼—3¼ times as long as basal diameter of that segment. Generally heavily brown pigmented, with a short spinal stripe and the sides of the abdomen pale. On *Populus deltoides* and *P. tremuloides*. Maine; New Brunswick (Canada). .... *Ch. populifolii* (Essig) *simpsoni* subsp. nov., p. 19

b(a) Hairs on dorsum shorter, also antennal hairs often blunt and shorter. Pigmentation variable.

c(d) Head and abd. tergites VII and VIII mostly dark, with the part of the dorsum between the head and caudal tergites either quite pale or rather evenly smoky, but without pale median line, and with the legs in pigmented specimens dark. Alatae with the transverse bars on the anterior abd. tergites either partly rather pale or completely invisible, with on IIIrd ant. segment 2—8 rhinaria. Apterous dwarfs with 5 ant. segments and rather dark legs common in summer in hot regions. On *Populus* spp. Widely spread in the Western part of the Continent .... *Ch. populifolii* (Essig) sensu stricto, p. 18

d(c) If both head, pronotum and the posterior tergites are dark, then they are connected by two more or less complete, broad, fore and aft medially joined brown bands that always leave a median stripe and the sides of the abdomen pale. Frequently only the head partly dark

and then VIIth and VIIIth abd. tergite hardly pigmented. Alatae with on each abd. tergite a distinctly dark pigmented band of about equal thickness, though not equal in length; their IIIrd ant. segment with 5—14 rhinaria. On *Populus* spp., mainly *P. tremuloides*. Utah, Colorado, Illinois, Minnesota, Connecticut .... *Ch. populifolii* (Essig), subsp. *neglectus* Hottes & Frison, p. 18

40 (39) Entirely pallid, only very rarely (in specimens developed at very low temperatures) pigmented, but then no median stripe present and IIIrd—VIth abd. tergites as dark marginally as spinally and not darker than VIIth or VIIIth tergite. Alatae usually with the rhinaria irregularly placed along one side and IVth segment rather often with rhinaria.

41 (42) VIIIth abd. tergite in apterae and alatae with 7—12, rarely 13 hairs. Longest hairs on IIIrd ant. segment in apterae mostly less than twice as long as basal diameter of that segment. Alatae with the sclerotic bars on abd. tergites III—VI much thicker than those on tergites I and II, those on tergites III—VI often more or less fused to a central dorsal patch; the rhinaria on IIIrd ant. segment not in a row, and also IVth segment with some rhinaria. Last rostral segment mostly with 8 hairs. On various *Populus* spp. Throughout North America .... *Ch. stevensis* Sanborn, p. 24

42 (41) VIIIth abd. tergite in apterae and alatae with 14—20 hairs. Longest hairs on IIIrd ant. segment more than twice as long as basal diameter of that segment. Alatae with the mutually free sclerotic bars on abdomen more or less equally thick, those on tergites II—IV often incomplete; rhinaria on IIIrd ant. segment usually rather regularly placed, with IVth segment usually without rhinaria. Last rostral segment normally with 10 hairs. On *Populus balsamifera* and related *Populus* spp. Wisconsin, Minnesota, Maine; New Brunswick (Canada) .... *Ch. balsamiferinus* spec. nov., p. 10

Notes on the species

Chaitophorus abditus (Hottes, 1926)

This species, originally described as a *Neothomasia* from Minnesota, apparently was not recorded from other states. It is, however, probable that most of the records by Gillette & Palmer (1931) and Palmer (1952) of both *Periphyllus macrostachyae* (Essig) and *P. salicicorticis* (Essig) refer to *abditus*. Of two collections of *macrostachyae,* recorded by these authors, after clearing one appeared to be *Ch. utahensis* (Knowlton), the other consisted of *Ch. abditus* (Hottes) with *Ch. pustulatus* spec. nov. Two slides labelled *Periphyllus salicicorticis* consisted only of *Ch. abditus* (Hottes). Without clearing it is indeed almost impossible to tell the three species apart, but after clearing recognition is very easy.

Ch. abditus, with *knowltoni* spec. nov., differs from *macrostachyae* and *salicicorticis* by having the sclerotisation of the abdomen in apterae completely broken up into short bars, marginal sclerites and numerous small sclerotic dots; in small specimens even the spinal bars may disappear. In contrast to *knowltoni, macrosta-*

chyae and *salicicorticis*, those samples of *abditus* that I have seen have the dorsal hairs not acute, but blunt and usually with the apices furcated. Apterae have no rhinaria and distinctly shorter antennae than *knowltoni*. For the rest the description of *knowltoni* fits *abditus* very well, but in the paratypes of *abditus* even the antennal hairs have furcated apices.

The hairiness of this species is very striking and it is already evident when the larvae are born. First instar larvae have on the abdomen on both sides groups of 4—7 marginal hairs per segment cephalad the siphunculi; one of these hairs is longer and stouter; on tergite IV I counted in total 24 hairs varying in two lengths, and, except the marginal ones, blunt. Suspecting that I mistook second instars for first instars I repeated the hair counts on embryones and found the same. Similar large numbers occur in *salicicorticis* and *macrostachyae,* but in *utahensis* only the marginal hairs are duplicated, so that in total 8 hairs are present on the IVth abd. tergite in new born larvae. I refrain from erecting a new taxon for these 4 species, although indeed they are mutually very closely related, and rather differ from the average *Chaitophorus*. However, *utahensis* links *abditus*, etc., to *populicola*, and from *populicola* to average *Chaitophorus* there is the *salicicola* group so that no clear subdivision is possible.

Material available: samples from Fort Collins and Rocky Ford, Colorado, collected from *Salix* by L. C. BRAGG, received as *Periphyllus macrostachyae* (Essig) and *P. salicicorticis* (Essig); apterous paratypes received from Dr. F. C. HOTTES.

Chaitophorus balsamiferinus spec. nov.

In general aspect like *Ch. stevensis* Sanborn. Entirely unpigmented, with even the tarsi pale. Body about 1.75—2.20 mm long, rather broadly pyriform. Dorsal cuticle densely covered with blunt nodules which form no regular pattern. Dorsal hairs on abdomen very numerous, thick, or more commonly with incised apices, variable in length, on IIIrd abd. tergite the longest spinal hairs to about 0.125 mm long, usually shorter, the marginal ones partly acute, much longer; VIIIth abd. tergite with 14—20 hairs varying in length. Antennae $2\frac{1}{2}$—3 times the width of the head through the eyes, conspicuously imbricated; IIIrd segment with some 12—20 hairs, the longest of which are often blunt and then up to two times basal diameter of the segment, to acute and then up to $3\frac{1}{2}$ times that diameter; processus terminalis about 3 times base of VIth segment, just shorter than IIIrd segment. Last rostral segment about $^{9}/_{10}$ of second joint of hind tarsi, with normally 10 hairs. Siphunculi conspicuously long, more than $^{2}/_{3}$ the length of 2nd joint of hind tarsi, on distal $^{2}/_{3}$—$^{1}/_{2}$ often cylindrical or even thinnest below the middle, with a reticulation of which the apical 3—4 rows have more or less isodiametric cells. Cauda knobbed, the knob slightly petiolate. First tarsal joints with 7, sometimes even 8 hairs (one additional hair in the middle of the sole).

Colour in life: greenish yellow with a thin bright green band on anterior margin of mesonotum, a broader band across metanotum and a short band or a V between the siphunculi. Male larvae dark brown, visible inside the mother's body; when born becoming purplish with the anterior part of the body yellowish.

Alatae very similar to those of *Chaitophorus populifolii* (Essig) sensu stricto, but with a long, dark sclerotic bar on Ist abd. tergite, the bars on tergites II—V

short and sometimes broken and pallid, that on tergite VI longer, those on tergites VII and VIII encircling the tergite. Antennae with 6—12 rhinaria on IIIrd segment, in a row when there are few, otherwise irregularly placed; IVth segment with 0—3 rhinaria.

Material: 3 apterae (cotypes) and one ovipara from *Populus balsamifera,* Presque Isle, Maine, 9.IX.1956, leg. G. W. Simpson & the author; 4 apterae from *Populus candicans* (*P. balsamifera*), Orono, Maine, 10.VII.1922, Maine Agr. Expt. Sta. no. 95—22, identified by E. M. Patch as *Chaitophorus delicata* Patch; 3 apterae and alatae from *Populus balsamifera,* Milwaukee, Wisconsin, 27.VII. 1933, leg. L. G. Strom; 1 aptera and several alatae from *Populus balsamifera,* St. Paul, Minnesota, 21/22.VI.1925, leg. F. C. Hottes; several samples from New Brunswick (Canada), including fundatrices, apterous and alate viviparae from *Populus gileadensis,* received from Mrs. M. E. MacGillivray.

This aphid is separated mainly for its remarkably developed siphunculi and its hairiness. If only one sample has been available I might have considered it an abnormal clone of *delicatus,* but now that several samples, collected over 30 years, are available, separation would seem to be justified. Differences from the nearest relative, *Ch. delicatus* Patch, are enumerated in the key.

Chaitophorus crucis (Essig, 1912)

Described from California as a *Thomasia.* The pigmentation could not be examined. Dorsum of head and thorax distinctly reticulated, on the abdomen only locally distinctly reticulated, elsewhere with transverse striae or strongly transverse cells. Antennae a little more than 1½ times width of the head measured through the eyes; processus terminalis about 1½ times base of VIth segment, at 180° to the base. All antennal hairs except those on base of IVth segment blunt, very stiff on IIIrd segment, up to 1½ times basal diameter of that segment. Rostrum to IInd abd. sternite. Cauda rounded triangular, with straight sides, about 0.078 (at base) × 0.02 mm or slightly shorter. First tarsal joints with 5—7 hairs.

In all other respects than those mentioned above the description of *Ch. pustulatus* spec. nov. on p. 20 fits this species. Unfortunately only few specimens are available, but it would seem that the species belongs in the *salicicola* Essig complex discussed on p. 21. The specimens look like starvation forms. The species has not been refound since 1912.

Material available: 3 apterous cotypes, kindly donated by Professor Essig.

Chaitophorus knowltoni spec. nov.

Body about 2.00—2.30 mm long, broadly oval, about $^{7}/_{11}$ times as broad as long with largest width in the middle. Tergum with head, pro- and mesonotum evenly rather dark sclerotic, but metanotum and abd. tergites I—VI each with a separate very thick spino-pleural bar and very large marginal sclerites; between these bars and the marginal sclerites large numbers of little brownish plates, each with a hair. The sclerotic parts with a distinct net of acute spinules. Hairs extremely numerous, acute, for a *Chaitophorus* short, with the longest spinal hairs on IInd abd. tergite about 0.050—0.055 mm long; longest of the about 20 hairs on VIIIth abd. tergite about 0.200 mm long. Antennae about twice as long as width of head measured through the eyes, thick, with basal segments and the apex

blackish, the rest brown; IIIrd segment more than twice as long as VIth and about twice IVth or Vth; hairs fine, extremely numerous on all sides, on IIIrd segment about as long as basal diameter of the segment; Vth segment at apex incrassate on outer side, with the primary rhinarium at its very apex; basal part of VIth segment with about 10—16 hairs, longer than the processus terminalis which has only about 10—12 imbrications; IIIrd segment on apical half with 1—5 rather small rhinaria on one side; IVth segment distally usually also with a rhinarium. Rostrum long, retractile (from measurements of the stylets reaching IInd—IIIrd abd. sternite); apical segment about as long as VIth ant. segment, about $1^1/_3$ times 2nd joint of hind tarsi, with some 20 hairs. Siphunculi broadly conical, pale, markedly reticulated with about 7 rows of cells, with 1—3 hairs on basal part. Cauda darkish, very broad and low, $3^1/_3$ times as wide at base as long, with 3 long hairs and several smaller hairs. Legs thick, hairy like the antennae, with the middle and hind femora and the basal part of the tibiae very dark, the fore femora and especially the middle part of the tibiae paler to pale; first tarsal joints with 7 hairs.

I take pleasure in dedicating this species to Professor G. F. KNOWLTON, Logan, Utah, who provided me with about 700 samples of unidentified freshly collected pickled material in the last few years, which I identified as far as possible. On my request he gave special attention to *Chaitophorus* species, but the present species which probably lives underground, was only twice found.

The apterae were found in large samples of *Ch. utahensis* (Knowlton). They stood out, after clearing, by a banded abdomen. The above description holds to a very large extent for *Ch. macrostachyae* (Essig) and *Ch. salicicorticis* (Essig), but those species have a compactly sclerotic tergum with even the VIIth abd. tergite fused with the 4 more anterior ones, no rhinaria on IIIrd and IVth ant. segment in apterae, and the primary rhinarium on Vth ant. segment well below the apex of the segment, which is normal in shape; their VIIIth abd. tergite has about 8—14 hairs.

Chaitophorus abditus (Hottes) is very closely related and *Ch. knowltoni* might be a subspecies. It differs from *abditus* in slightly longer antennae, notably the IIIrd segment, in the presence of secondary rhinaria in apterae, and in the acute hairs. It more or less agrees with *abditus* in the position of the primary rhinarium of VIth ant. segment, and most other mentioned characters.

Material available: from *Salix*. 2 apterae viviparae (cotypes) from Redmond, Utah, 11.VI.1957, 1 aptera vivipara from Salina, Utah, 12.VI.1957, leg. G. F. KNOWLTON; 3 alatae from *Salix* bark, Leeds, Utah, 8.VII.1958, leg. G. F. KNOWLTON probably are this species, but as no other corresponding morphs were found, definite identification is not yet possible.

Chaitophorus longipes Tissot, 1932

Tergum more or less evenly dark sclerotic, on mesothorax to IInd abd. tergite medially vaguely paler; abd. tergites I—VI solidly fused. Cuticle with rather dispersel blunt nodules, sometimes seemingly imbricated, nowhere reticulated. Dorsal hairs markedly fan-shaped and incised at apex. Antennae nearly three times the width of the head measured through the eyes; IIIrd segment with about

6—9 hairs, the 3—4 longer ones (0.05—0.06) on inner side cylindrical with furcated apices, those on outer side blunt, to about 0.030 mm long; longest hair on VIth segment about 0.035 mm. Rostrum reaching to or just past the hind coxae; last segment long and rather slender, about $1^1/_5$ times 2nd joint of hind tarsi, with 12—15 fine hairs. Area surrounding the siphunculi hardly pale. First tarsal joints with 5 hairs, 2—4 of which are much longer (0.05) than the joint (0.039 mm).

Confusion of this species with others is hardly possible. There is besides *Ch. viminicola* spec. nov. no other North American species known with a knobbed cauda and such a both long and hairy last rostral segment, and with only 5 hairs on the first tarsal joints. *Ch. viminicola* spec. nov. differs by its very long, acute hairs.

Material available: 3 apterae from *Salix longipes* (= *S. caroliniana*), St. Augustine, D. & B. Dairy, Florida, 17.V.1945, leg. A. N. Tissot, identified by Professor A. N. Tissot and kindly presented to me.

Chaitophorus macrostachyae (Essig, 1912)

Like *salicicorticis* originally described as a *Symdobius* (= *Symydobius* Mordv.), later by Gillette & Palmer (1931) transferred to *Periphyllus* v. d. Hoeven. It is doubtful whether the two are distinct species. Unfortunately of both only type-material, kindly donated by Professor Essig, is available and these samples are so alike that in view of the variability in related species I fear that they differ at most subspecifically. In fact, the only difference I have so far found is in the length of the hairs as indicated in the key. The rostra when extracted to their full lengths are about equally long, also their last segments.

For differences from *utahensis* vide sub *Ch. utahensis* (Knowlton). The nearly related *Ch. knowltoni* spec. nov. is discussed on p. 11. With certainty known from California only. Some larvae from Oregon are either this species or *Ch. salicicorticis* (Essig). Records from Colorado and Utah at least partly relate to *abditus* Hottes.

Material available: cotypes kindly donated by Professor E. O. Essig.

Chaitophorus minutus (Tissot, 1932)

This species was described as a *Sipha*, because it has 5 ant. segments, even in the alatae. Boudreaux (1951) pointed out that in Louisiana specimens with 6 ant. segments occur and referred the species to *Chaitophorus*.

In general aspect like *Ch. pusillus* Hottes & Frison. Tergum uniformly pale, with the front and the margin of the abdomen somewhat granulated. Dorsal hairs long, deeply furcated at apex. IIIrd ant. segment on inner side with two very long (0.08—0.10 mm) stiff, blunt hairs, one on basal half, one near apex, sometimes in addition a shorter (0.06 mm) hair, on outer side with two very short (0.011 mm) hairs; IVth with one similar long and one similar short hair, but Vth only with a short (0.010 mm) hair. Last rostral segment slender, acute, with 8 hairs, just longer than 2nd joint of hind tarsi. Siphunculi faintly dusky on distal half. Hairs on hind tibiae up to twice diameter of the tibiae. First tarsal joints with 5 hairs.

Alatae show the basal ant. segments much paler than the head; IIIrd ant. segments with 2 to, according to Tissot, 8 rhinaria, often confined to basal $^3/_5$ part in my specimens. The dorsum seems to have faint thin dusky transverse lines per segment. In the hind wings I cannot observe oblique veins (TISSOT writes that they are faintly indicated).

I have supplemented TISSOT's description with a few details, like those given for the new species. The best identification character is the long rostrum and last rostral segment which makes confusion almost impossible.

Because BOUDREAUX's decision to place this species in *Chaitophorus* can be accepted, *Chaitophorus minutus* H.R.L., 1954, requires a new name as Dr. V. F. EASTOP kindly pointed out to me. Therefore I propose the name **Chaitophorus israeleticus** nom. nov. for *Chaitophorus minutus* Hille Ris Lambers, 1954 (*Bull. Res. Counc. Israel*, vol. 4, p. 279) nec TISSOT, 1932 (as *Sipha, Florida Entom.*, vol. 16, p. 16).

Material available: 6 apterae and 2 alatae from *Salix* sp., Dr. Phillip, Florida, 17.VI.1948, leg. O. D. LINK, identified by Professor A. N. TISSOT and kindly presented by him.

Chaitophorus monelli (Essig, 1912)

Originally described as the type of the genus *Micrella* Essig, 1912, from *Salix lasiolepis,* Oxnard, California. One cotype was most kindly sent by Professor ESSIG, but through an accident lost during the remounting process. A second cotype could then be borrowed from the British Museum (Nat. Hist.) and this was successfully remounted. Even before remounting it was clear that in both cotypes the siphunculi are distinctly and normally reticulated, contrary to the original description; only the shape of the cauda distinguishes the species from normal *Chaitophorus.*

Seemingly the species had not been refound since 1911, but among the *Chaitophorus* received for study from the British Museum there was a slide from Berkeley identified by Professor ESSIG as *Chaitophorus pusillus* Hottes & Frison which contained apterae and alatae of *monelli.* Therefore more data on this aphid are now available.

Apterae. Very small, 1—1.2 mm, not pigmented and dorsally except for some scattered granules on the middle of the thoracal nota approximately smooth. The dorsal hairs thick, stiff, with dove-tailed apices. Antennae pale, thin, conspicuously imbricated, rather long; processus terminalis about 3 times base of VIth segment. Hairs on inner side of IIIrd, IVth and Vth segment stiff with blunt or furcated apices, several times basal diameter of IIIrd segment; base of VIth segment with only 1—2 short acute hairs similar to those on outer side of segments III—V. Eyes small, with the triommatidion not pronounced. Rostrum with last segment blunt, about $^2/_3$ of 2nd joint of hind tarsi, with 8 hairs. Siphunculi rather large, pale, reticulated. Cauda variable within the sample, often without a trace of constriction, sometimes with a faint constriction at distal one-third part, with 6—7 hairs. Legs pale, rather long and thin; tibiae, especially the fore and middle tibiae with unusually distinct slightly spinulose imbrications on distal $^1/_2$—$^1/_3$; first tarsal joints with 5—7 hairs, normally at least on some legs with 7 hairs.

Alatae. With rather narrow quite separate dark transverse bars on abdomen. Dorsal hairs nearly acute, thinner and longer. Antennae dark with base of IIIrd segment pale; IIIrd segment with 4—7 rhinaria more or less in a row. Siphunculi dark. Cauda slightly but distinctly constricted, the "knob" very much wider than long. Tibiae much more distinctly spinulosely imbricated than in apterae.

Clearly the misidentification of the Berkeley specimens as *Ch. pusillus* is understandable. *Ch. monelli* and *pusillus* are very nearly related and apart from the structure of the cauda hardly distinguishable, but in *pusillus* the first tarsal joints have 5 hairs, the tibiae are only very faintly imbricated, and the abdomen in alatae has broader bars which sometimes fuse into a central sclerite. The interrelation between the two species is about the same as that between *Ch. nigrae* Oestl. and *Ch. salicicola* (Essig).

Material available: 2 apterae viviparae (cotypes), from *Salix lasiolepis*, Oxnard, California, 20.VII.1911, leg. E. O. Essig; 11 apterae and 3 alatae from *Salix* leaves, Berkeley, California, 30.VII.1935, leg. P. Schulthess.

Chaitophorus nigrae Oestlund, 1886

Recently some authors following Davis (1912), Patch (1913) and Hottes & Frison (1931) have made *nigrae* Oestl. a synonym of *viminalis* Monell. What Baker (1917) wrote about differences between *nigrae* and *viminalis* happens to be correct, notwithstanding the fact that what he described as *viminalis* in that paper consists of two other species. But Oestlund (1922) also points out these differences and that should have been considered. *Chaitophorus cordatae* Williams, 1911, is a synonym (Baker, 1917, 1923); I could examine and remount the types.

The material that I consider to belong to this species is rather heterogeneous but it has several characters in common. The dorsum is to a variable degree reticulated, and when the cells are not closed there are acute spinules that at least locally on the mesonotum form more or less closed cells. The cauda is very little knobbed in dorsal view; sometimes there is a slight neck, but in some samples the apical portion is almost parallel-sided (vide also *Ch. salicicola* Essig, p. 21). The pigmentation of the dorsum is variable; pale specimens (type of *Chaitophorus cordatae* Williams, 1911) are rare; usually as a minimum there are two large blackish blotches pleurally on the thorax and abdomen, which then merge, so that the blackish insect is divided into two parts by a broad colourless band from head to tail; this median band may be further reduced to a median spinal line, and, in extreme cases, vanish altogether. There seems to be seasonal variation; in early summer specimens the colourless areas are the largest. The dorsal hairs vary from long with very fine acute apices, to all or partly blunt with dove-tailed apices; rarely even the marginal hairs are furcated at apex. The antennal hairs are long and wavy on inner side of all segments of the flagellum, but those on outer side vary in length; all these hairs are always acute, with fine apices. The legs, especially the tibiae are unexpectedly pale; the first tarsal joints have 5 hairs, rarely on one or two legs 6 hairs.

Specimens from Salina, Utah, 12.VI.1957, leg. G. F. Knowlton, and from Axtell, Utah, 11.VI.1957, leg. G. F. Knowlton, have broad pale median bands

and very pronounced reticulation. Similar specimens were received from St. Paul, Minnesota, 28.VI.1925, leg. F. C. HOTTES. One specimen in a sample from Orono, Maine, 23.VII.1925, leg. PATCH, looks the same. These specimens have a membraneous ring around the siphunculi and their body is broader oval than in other samples. Most of the other specimens, from Fort Collins, Colorado, 26.VII.1911, and 8.VII.1911, leg. L. C. BRAGG, the Orono sample mentioned above, from Fredericton, New Brunswick (Canada), 5.IX.1950, leg. VASS, have a pale median line and the siphunculi are more or less surrounded by white. The reticulation is only very distinct on the pale zone on the middle of the mesonotum, incomplete elsewhere.

A sample from Rouge River Valley, Ontario (Canada), 6.VI.1948, leg. S. F. MACDONALD (received from Dr. H. L. G. STROYAN), has very distinct reticulation, but though collected in early summer, the specimens have the siphunculi as dark as the abdominal shield and not surrounded by a pale median ring. The last rostral segment in the specimens is 1.1—1.2 times as long as the 2nd joint of the hind tarsi, which is rather above normal.

Two samples, one from Fredericton, New Brunswick (Canada), 18.VII.1957, leg. M. E. MACGILLIVRAY, the other from Estes Park, Colorado, 27.VII.1921, leg. M. A. PALMER, consist of evenly black specimens, with very distinct reticulated areas. The latter sample has rather short dorsal hairs with enlarged, dove-tailed apices and the cauda is hardly constricted, so that it can hardly be distinguished from *Ch. saliciniger* (Knowlton).

As the key indicates, Rocky Mountains samples differ by having furcated dorsal hairs. As specimens from the type locality have normal, fine hairs like all more Eastern specimens, I erect the subspecies **Chaitophorus nigrae** Oestlund **nigrescens** subsp. nov. for the Western forms with partly blunt or furcated, rather short hairs. The cotypes are from *Salix*, Salina, Utah, 12.VI.1957, leg. G. F. KNOWLTON.

A small sample from *Salix*, Pleasant Gap, Pennsylvania, 31.VIII.1941, submitted by its collector, Dr. J. O. PEPPER, consists of blackish apterae with a pale median line in which the reticulation is nearly absent, and replaced by rows of semi-acute spinules; only on the pleura of the abdomen there are some nearly closed cells. Its most remarkable character is that abd. tergite VII is completely fused with tergites I—VI, which is not the case in any other specimen that I saw. BÖRNER used this fusion of tergites I—VII for reviving *Tranaphis* Wlk., but in the present case I at most venture to erect a subspecies for these specimens, for which I choose the name **Chaitophorus nigrae** Oestl. **tranaphoides** subsp. nov.

Chaitophorus populicola Thomas, 1878

As the alatae of this species are well recognisable by the banded venation in their wings it probably has not been confused with other species, except in a few cases when stray alatae of *Ch. utahensis* (Knowlton) with a similar vein-banding had been mistaken for *populicola* Thos.

Chaitophorus bruneri Williams, 1911, is considered a synonym. BAKER (1917) separates *bruneri* from true *populicola* by the shape of the hairs, GILLETTE & PALMER (1931) and PALMER (1952), by the colour. BAKER writes that the dorsal hairs in *bruneri* have abnormal apices, those in his further material fine and acute

apices. Such differences indeed occur in material from North America, but it then appears that in the East, and sometimes in the West at high altitudes, the dorsal hairs are normal in shape, while elsewhere they have all or partly blunt, acuminate, furcated or fan-shaped apices. I have not seen a redescription of the type material of *populicola,* but as material from Illinois that I could examine has abnormal hairs, I suppose that Thomas' material shows the same, in which case Baker's (1917) identification was wrong. In the pigmentation and colour there is some variation, but not in such a way that a taxonomic subdivision on this basis could be made.

Material from Minnesota, Connecticut, Pennsylvania, Maine and New Brunswick (Canada), and some from the Grand Mesa (3000 m) in Colorado shows all abdominal hairs extremely long and fine. This material in other respects does not differ from the other samples. As it would seem to be a well defined taxon, the name **Chaitophorus populicola** Thomas **patchae** subspec. nov. is applied. The types are from *Populus tremuloides,* Fredericton, New Brunswick (Canada), 11.IX.1956, leg. M. E. MacGillivray and the author. Dr. F. C. Hottes and the author took it also from the same host on the Grand Mesa, Colorado, 16.IX.1956, with alate males and oviparae. Samples from Maine and Connecticut are in the Patch collection. It should be mentioned that typical *populicola* is much more common on *Populus tremuloides* in the Rocky Mountains than its subspecies.

Mention should be made of the fact that some samples, taken on the bark of older twigs or on old bark wounds of young trees apart from consisting of larger specimens, show a processus terminalis that is often hardly longer than the base of VIth ant. segment and, besides, sometimes up to 9 hairs on the base of VIth segment. Only in this respect they differ from the average specimens of subspec. *patchae.* Such abnormal samples were received from Pennsylvania (leg. J. O. Pepper) and collected by Dr. Hottes and the author on the Grand Mesa in Colorado. Records from Central Asia relate to the species *Neothomasia pruinosae* Narzikulov, 1954, which merits a new subgeneric or generic name.

Most of the samples examined are from *Populus tremuloides*, but also other *Populus* spp. may be infested.

Material of *Ch. populicola* Thos. s.s. is available from Wyoming, Utah, Colorado, Texas and Illinois.

Chaitophorus populifolii (Essig, 1912)

This species was originally described as *Eichochaitophorus populifolii* from California. It is part of a complex of subspecies that as far as the samples go show small differences but that probably cannot be separated clearly when their full range could be examined. They are keyed on p. 8.

Gillette & Palmer (1928) gave *Chaitophorus essigi* as a new name for *Ch. populifolii* Essig, 1912, because they thought that is was preoccupied by *Ch. populifoliae* Fitch of Oestlund or of Davis. But, as pointed out on p. 24, *Chaitophorus populifoliae* is an invalid name, and therefore it could not preoccupy *Chaitophorus populifolii* Essig. Consequently the name *Chaitophorus populifolii* Essig is reestablished here and *Ch. essigi* Gillette & Palmer is listed as a synonym.

The variability of this species is only comparable to that of *Ch. versicolor*

Koch, which does not only vary with the season, but in which in one single colony one may find apterae with a bewildering variation in colour and pigmentation.

The following subspecies are used in this paper.

a. **Chaitophorus populifolii** (Essig, 1912) sensu stricto

Synonyms are *Eichochaitophorus populifolii* Essig, 1912, *Ch. populellus* Gillette & Palmer, 1928, *Ch. essigi* Gillette & Palmer, 1928, a new name for ESSIG's species. Rather characteristic for this subspecies is the pigmentation of the VIIth and VIIIth abd. tergite which develops simultaneously with the pigmentation of the pro- and mesonotum; the rest of the dorsum may darken but not with a pale median line, and unto the very margins of the abdomen. The dorsal hairs and usually also part of the hairs on IIIrd ant. segment are mostly blunt or furcated. The hairs on IIIrd ant. segment are only rarely up to twice as long as basal diameter of the segment. The last rostral segment in small specimens may be about as long as 2nd joint of hind tarsi, but usually it is much shorter. In alatae the number of rhinaria varies from 2—8 and on abd. tergites I—V the sclerotic bars tend to fade in the middle or become completely pigmentless. Males normally apterous. Other subspecific characters are mentioned in the key.

Summer dwarfs with often 5-segmented antennae and dark legs seem to be common. It is this subspecies that BÖRNER in 1952 records as *Eichochaitophorus roepkei* (Börner, 1931) from Europe, though the 1931 description relates to *Chaitophorus albus* Mordv., 1901 in the first place.

Material available from California (including cotypes of *Eichochaitophorus populifolii* Essig, received from Professor ESSIG), Utah (collected by Professor G. F. KNOWLTON), Colorado (identified as *Ch. populifolii* by Professor GILLETTE, besides alate paratypes and apterous metatypes of *Chaitophorus populellus* Gillette & Palmer); Alberta (Canada) (identified by Professor M. A. PALMER as *Ch. populellus* Gillette & Palmer).

b. **Chaitophorus populifolii** (Essig) subsp. **neglectus** Hottes & Frison, 1931

Similar to the preceding, but the pigmentation on the posterior abdominal tergites develops later, simultaneously with two partly coalescing bands connecting fore and aft, and the granulation of the abdomen is much more pronounced, often forming a net on the middle of the thoracic nota. In the type specimens the dorsal hairs on abdomen are blunt or furcated and the antennal hairs acute, but very large samples from the mountains of Utah and Colorado from *Populus tremuloides* have also the hairs on IIIrd ant. segment blunt and not much longer than the diameter of the segment. The last rostral segment is, particularly in large specimens, relatively shorter, $^2/_3$—$^9/_{10}$ of the length of 2nd joint of hind tarsi. In alatae the bands on abdomen are all well pigmented and the number of rhinaria is on average higher, about 5—14, with occasionally a rhinarium on IVth segment. Males usually alate. Other characters are mentioned in the key. Various *Populus* spp., including *P. deltoides*, *P. grandidentata* and *P. tremuloides* are infested, often in mixed colonies with *Chaitophorus stevensis* Sanborn.

Material available: from Illinois (paratypes kindly sent by Dr. Ross), Utah (collected by Professor G. F. Knowlton), Colorado (very extensive collections made by Dr. F. C. Hottes), Connecticut (identified by A. C. Baker as *Ch. viminalis* Monell) and Minnesota.

c. Chaitophorus populifolii (Essig) simpsoni subsp. nov.

Pigmentation strongly developed, but the nodules on the thoracal nota not forming a distinct reticulated pattern. Very characteristic are the very long, fine hairs on dorsum and IIIrd ant. segment (vide key). The last rostral segment is $^{7}/_{10}$ of the 2nd joint of the hind tarsi in length. In life this subspecies is greenish white on the under side, dorsally brownish black, dull, with a spindle-shaped median line from mesonotum to the siphunculi more or less pale. Siphunculi whitish. Antennae pale with basal segments, distal half of Vth, and VIth segment dark. Legs pale with smoky 2nd tarsal joint. Males alate; their larvae are evenly dark pale mesonotum and pale wingpads.

Available material: rather large colonies without ants from under and upper sides of leaves of *Populus tremuloides*, Presque Isle, Maine, 9.IX.1956, leg. G. W. Simpson and the author; from *Populus* sp., Fredericton, New Brunswick (Canada), 19.VIII.1953, leg. M. E. MacGillivray; from *Populus grandidentata*, State College, Pennsylvania, 8.VIII.1950, leg. J. O. Pepper.

Evidently this species represents the American version of the European *Chaitophorus versicolor* Koch which now also occurs in the U.S.A. Separation is not always easy, except when the rostral apex can be studied. It appears to be extremely difficult to separate pale apterous specimens of this species from *Ch. stevensis* Sanborn. Alatae can fairly easily be separated by the different sclerotisation on the abdomen and the differences in arrangement of rhinaria on IIIrd ant. segment.

Chaitophorus pusillus Hottes & Frison, 1931

The main characteristic of this aphid is its smallness and absence of pigmentation but it might well be different in its 2nd generation. Through the kindness of Dr. Ross I could remove and remount two apterae from paratype slide nr. 10696. To the extensive original description I add some notes on these apterae. They are, apart from some indistinct granulations on the front and thorax, quite smooth. The IIIrd ant. segment on inner side with 2—4 quite stiff hairs with acute or nearly acute apices which are about 4 times as long as basal diameter of the segment, but the 1—2 on outer side are thin and only about as long as that diameter; also on segments IV and V such difference between hairs on inner and outer side present; base of VIth segment with rather short hairs. Last rostral segment short and blunt, in length $^{2}/_{3}$—$^{3}/_{4}$ of 2nd joint of hind tarsi, with 8 hairs. Hairs on dorsum with moderately blunt, furcated apices, also those on vertex. First tarsal joints with 5, rarely on some legs 6 hairs. In the alate paratype the rhinaria on IIIrd ant. segment number 7 and 8; they are not at all placed in a row and unusually large in comparison to the thin segment.

From additional material it appears that in apterae the dorsal hairs may be nearly all acute, that the hairs on IIIrd ant. segment may be blunt or furcated at

apex and then only about 3 times basal diameter of IIIrd ant. segment and that in alatae the number of rhinaria on IIIrd segment may be up to 11, with up to 3 on IVth segment. The base of VIth ant. segment may be comparatively longer, so that the processus terminalis may be little more than twice as long as basal part of VIth ant. segment (in PATCH's specimens).

The nearest relatives to this species are *Ch. monelli* (Essig) and the true *Ch. viminalis* Monell. The latter differs by thicker antennae with more pronounced and much denser imbrications, and with more and comparatively shorter hairs on IIIrd segment but with a comparatively much longer hair on base of VIth segment, and with up to 15 rhinaria in alatae; the dorsum in apterae (marginally in alatae) is distinctly verrucose; the first tarsal joints have 7 or 6 hairs. Differences between *pusillus* and *monelli* are discussed on p. 15.

Chaitophorus minutus (Tissot) looks very similar, but may at once be separated by its long last rostral segment.

Chaitophorus stevensis Sanborn and *Ch. balsamiferinus* spec. nov. may look similar, but the chaetotaxy of their last rostral segment, first tarsal joints and antennae are different.

Further material available consists of apterae and alatae from *Salix discolor,* Orono, Maine, 5.VI.1918, Maine no. 39—18, identified by E. M. PATCH as *Chaitophorus delicatus* Patch; of samples of apterae from *Salix* collected by the author in the Laurentide Park, Quebec, 27.VIII.1956, near Fredericton, New Brunswick (with Mrs. MACGILLIVRAY), 4.IX.1956, and near Presque Isle, Maine (with Dr. G. W. SIMPSON), 10.IX.1956; a sample from *Populus tremuloides* intermingled with a willow taken near Fredericton, New Brunswick (with Mrs. MACGILLIVRAY), 2.IX.1956, also belongs to this species but I doubt whether the species can live on both *Salix* and *Populus*.

Chaitophorus pustulatus spec. nov.

Body oval, small, about 1.00—1.90 mm long and about $^3/_5$ times as wide as long, with variable brown pigmentation; middle portion of the body usually little pigmented. Head dark, thoracic nota dark with a wide median colourless band and abd. tergite, III—VI also dark with a wide median pale band and pale areas around the siphunculi; in very dark specimens the abdominal spinal stripe disappears, the pale transverse band on the middle of the body becomes laterally dark and so only the median pale stripe from pronotum till IIIrd abd. segment remains. In the available samples all dorsal hairs, except usually the hairs on the VIIIth abd. tergite, are very thick and short (e.g., 0.065 mm for the primary spinal hairs on IInd abd. tergite), with markedly blunt, furcated or chisel-shaped apices. VIIth abd. tergite quite free from VIth. Antennae only about $1^1/_3$—$1^9/_{10}$ times as long as the width of the (broad) head measured through the eyes; IIIrd segment varies with the pigmentation of the body from pale to, especially apicad, smoky brown and it is often only about as long as VIth segment; processus terminalis not or very little longer than base of VIth segment and it normally makes an angle of about 170° with the basal part. The few hairs on IIIrd ant. segment on inner side rather stiff, with mostly acute apices and up to about twice as long as basal diameter of the segment, the 1—2 hairs on the outer side not

very much shorter and also the longest hair on the base of VIth segment rather long. Rostrum reaching to just past hind coxae or shorter; apical segment like that in *Ch. nigrae* Oestl., rather pointed and about as long as 2nd joint of hind tarsi, with 8 hairs, with one of the subapical pairs placed far basad. Siphunculi shortly conical, pale like area surrounding them. Cauda dusky to dark, broadly rounded, usually less than half as long as wide at base. Legs short, in pale specimens with only the middle portion of the tibiae pale, in dark specimens completely blackish; first tarsal joints with 5—7 hairs, in small specimens each of these numbers often present on the 6 legs of one specimen.

Small specimens of this species strongly resemble *Chaitophorus crucis* (Essig), but that species has the dorsum covered with a conspicuous transverse reticulation which only marginally passes into nodules, and its antennal hairs are blunt. For differences from other species I refer to the key.

Material available: 6 apterae from *Salix*, Basin, Wyoming, 12.IX.1941; 46 apterae from *Salix* leaves, Helper, Utah, 26.VIII.1958; 76 apterae from *Salix*, Price, Utah, 26.VIII.1958; 12 apterae from *Salix* leaves, Spanish Fork Canyon, Utah, 26.VIII.1958; 12 apterae from *Salix,* Wellington, Utah, 26.VIII.1958, and larvae, all collected by G. F. Knowlton and considered cotypes; one aptera from a slide with *Ch. abditus* Hottes, from *Salix,* Rocky Ford, Colorado, 27.V. 1908, leg. L. C. Bragg, identified by M. A. Palmer as *Periphyllus macrostachyae* (Essig).

Chaitophorus salicicola Essig, 1911

Only Essig (1911, 1912) and Swain (1919) seem to have recognized this aphid, which originally was described from leaves of *Salix laevigata* and from *Populus.* I also examined specimens from *Salix lasiolepis* but not from *Populus*, a very doubtful host plant for a willow-infesting aphid.

The material that Professor Essig identified as *salicicola* is, as far as the apterae are concerned, very heterogeneous. But that appears to be normal in the species of the complex to which *salicicola* belongs, the *nigrae-salicicola* complex of species.

If one studies enough samples of *Ch. nigrae*, one finds specimens or even whole collections in which the cauda is not knobbed. There may be a trace of a constriction, and then there is a knob, but there is no neck. Such specimens with a faint constriction of the cauda usually have at one or more of their legs 6 instead of 5 hairs. At the end of the scale there is *Ch. saliciniger* (Knowlton) which has a broadly rounded cauda comparable to that in *populicola* Thos. If the cauda has no trace of a constriction one generally finds 7 hairs on the first tarsal joints. In the more Eastern states the cauda is usually knobbed, but in the West only alatae sometimes show a faintly knobbed cauda.

The structure of the integumentum is rather uniform; the dorsum shows acute spinules that usually form a distinct reticulated pattern, particularly laterally on the thorax, but often on the whole dorsum. The dorsal hairs vary considerably; they may be long and fine, or thick and markedly enlarged and incised at apex and the antennal hairs vary in a corresponding way. The pigmentation varies as described in *nigrae.* Alatae may give a clue, but not many are available from colonies that contained also apterae.

With a very large material from all over the continent it may be possible to distinguish species satisfactorily, but with the limited number of samples at my disposal I can only discuss the difficulties, which are not sufficiently reflected by the key.

A. Ch. **salicicola** Essig.

(1). Apterae from *Salix lasiolepis,* 13.VI.1916, U.C. Campus, Berkeley, California, are almost quite black with a vague paler median line; siphunculi not surrounded by a pale area; dorsal hairs fine, to 0.13 mm long, with a few blunted ones; reticulations only pleurally on thorax complete; antennal hairs fine, on IIIrd segment to $3^1/_3$ times basal diameter of that segment; cauda broad, not constricted, width at base $1^{11}/_{17} \times$ length. Alatae with broad, not fused bands on abdomen; IIIrd ant. segment with 5—7 rhinaria in a row; no rhinaria on IVth; cauda narrower, not knobbed.

(2). Apterae and one alata, from *Salix* sp., 28.IV.1935, U.C. Campus, Berkeley, California, quite as before, but alata with 8—9 rhinaria on IIIrd segment, on one antenna with one rhinarium on IVth.

(3). Apterae from *Salix* sp., 4.II.1947, Guadalupa, California, leg. A. J. HANSON, pale, in some with more or less confluent pleural pigmentation, and with pale siphunculi; dorsal hairs thick and blunt with widened, dove-tailed apices, up to about 0.075 mm long; reticulation pleurally very distinct; hairs on IIIrd ant. segment stiff, less than twice diameter of the segment; cauda as in A-1.

(4). One aptera and 3 alatae from *Salix* sp., 30.VI.1948, Arroyo Seco, Greenfield, California, leg. J. W. MACSWAIN, aptera like A-3; alatae like A-1, with 5—7 rhinaria on IIIrd ant. segment, none on IVth.

Evidently this species, though constant as alatae, has quite a variation in the apterae corresponding to that in *Ch. nigrae* (vide p. 15); the pigmentation varies remarkably, and the differences in the shapes of the dorsal hairs in apterae are quite surprising.

B. Ch. **saliciniger** (Knowlton).

(1). The apterous types, from *Salix* sp., 8.VII.1925, Cedar Canyon, 7.000 ft a.s.l., Utah, leg. G. F. KNOWLTON are almost black, with a pale median line; the dorsal hairs are as in A-3 and A-4, but the hairs on IIIrd ant. segment are thin and fine and up to about $2^1/_2$ times diameter of segment; the cauda, however, is at base twice as wide as its length. Inside a nymph with wingpads the dorsal hairs in the alata-to-be are clearly furcated and the antenna shows a few rhinaria on IVth segment; in an alata the dorsal hairs are nearly acute and up to 0.09 mm long, with 9—11 rather irregularly placed rhinaria on IIIrd ant. segment, 1—3 on IVth and 0—1 on Vth, while the cauda is as in the apterae.

(2). From *Salix,* 20.VIII.1957, Logan Canyon, Utah, 28.VIII.1957, leg. G. F. KNOWLTON. Large numbers of pale apterae with a few irregularly pigmented ones; dorsal hairs in the pale specimens long and with acute, fine apices, but in the more pigmented specimens with chisel-shaped, incised apices; reticulation in the pale specimens hardly developed, in the dark ones distinct on the thorax; antennal hairs fine and long; cauda intermediate between A-1 and B-1. In a sample of apterae taken in the same locality 8 days later the hairs are more frequently furcated.

(3). From *Salix,* 14.IX.1956, Grand Mesa, Colorado, leg. F. C. HOTTES &

H. R. L. One pale and one dark aptera with a pale median line. Dorsal hairs furcated. Thoracal area clearly reticulated. Cauda as in A (1).

All the preceding samples have 6—7 hairs on the first tarsal joints and this, with the non-constricted and shorter cauda, distinguishes them from *Ch. nigrae* Oestl., which, however, as to antennae, dorsal ornamentation, last rostral segment, in fact as to almost all other characters is quite similar. It is impossible to draw a sharp borderline between *nigrae* and the complex mentioned above. Later studies may prove that *saliciniger* and *salicicola* are geographical races, i.e., subspecies of *nigrae*.

Since *Ch. salicicola* Essig, 1911 preoccupies *Ch. salicicolus* Mats., 1917, the latter requires a new name. I propose as new name for *Chaitophorus salicicolus* Matsumura (1917, Journ. Coll. Agric. Tohoku Imp. Univ. Sapporo, vol. 7, p. 376—377) the name **Chaitophorus matsumurai** nom. nov.

Chaitophorus salicicorticis (Essig, 1912)

Described as a *Symdobius* (= *Synydobius* Mordv.). Apart from differences in lengths of hairs (vide key) I have not found differences between cotypes of this species and cotypes of *macrostachyae* Essig. Gillette & Palmer (1931) and Palmer (1952) describe this species (as *Periphyllus*) from Colorado. Professor Palmer kindly sent me some slides of Colorado specimens from *Salix nigra*, Fort Collins, Colorado, 7 and 18.VII.1908, leg. L. C. Bragg but these were *Chaitophorus abditus* (Hottes) which could only be recognized after being cleared. Whether the species really occurs outside California, I do not know.

Material available: only cotypes, kindly donated by Professor Essig.

Chaitophorus saliciniger (Knowlton, 1927)

Originally described as a *Neothomasia.* Discussed on p. 22 sub *Ch. sallicicola* Essig.

Chaitophorus salicti (Schrank, 1801)

Williams (1911) records this species from *Salix* sp., Nebraska, but he interchanged apterae viviparae and oviparae (the latter smaller, and with a knobbed tail, which is not known in *Chaitophorus*). Davis (1912) refers Williams' insects to *Chaitophorus viminalis* Monell. From his figure of the antennae (pl. 11, fig. 15) of an aptera vivipara this looks very likely. Of the American forms only *Chaitophorus nigrae* Oestl. may resemble *salicti* Schrank to some small extent. I did not examine Williams' specimens, but his description excludes identity with *salicti* Schrank.

Chaitophorus stevensis Sanborn, 1904

This species offers more problems than any other North American *Chaitophorus*. Oestlund (1887) described a *Chaitophorus* from *Populus* under the name *Chaitophorus populifoliae* Fitch. He mentions only the alatae. In his Synopsis of

Minnesota Aphids (1922) there is no reference to this aphid, but there we find the name *Chaitophorus delicata* Patch for evidently the same aphid.

DAVIS (1910) states that *Aphis populifoliae* Fitch is a *Pterocomma,* not a *Chaitophorus* and proposes the name *Chaitophorus populifoliae* Oestlund for our species, without giving a description, though announcing one. As OESTLUND erroneously did not credit himself with *populifoliae,* the procedure suggested by DAVIS has to be rejected, and therefore *Chaitophorus populifoliae* Oestl. is not available as a name. PALMER (1952) uses the name *Chaitophorus populifoliae* Davis, 1910, but also that cannot be accepted, for DAVIS named no such species. This means that one has to look for another name for this widely spread aphid from *Populus* spp.

PATCH (1913) described *Chaitophorus delicata* from *Populus tremuloides,* and in her Food-Plant Catalogue (1938) records it also from *P. balsamifera* and *Salix.* Through the kindness of Dr. G. W. SIMPSON I could examine all the *delicatus* in the PATCH collection. The record from *Salix* relates to *Chaitophorus pusillus* Hottes & Frison, 1931. I refer the specimens from *Populus balsamifera* to *Chaitophorus balsamiferinus* spec. nov. The specimens from *Populus tremuloides,* labelled cotypes, are now cleared and remounted, and they are evidently the aphid that is better known as *Chaitophorus populifoliae* Oestl. or Davis.

However, there is an older name available for this species. SANBORN (1904) described *Chaitophorus stevensis* as an inquiline from galls on *Populus monilifera.* Later references to this species are by SANBORN (1906) who in the errata to his earlier paper makes the species a synonym of "*populifolia* Fitch", and by BAKER (1917, 1923) who lists *stevensis* Sanborn as a synonym of *viminalis* Monell, in connection with a sample of *Chaitophorus* from Connecticut.

The description by SANBORN (1904) is remarkable. The length of the antennae is given as 1.17 mm, but when the measurements of the separate joints are added up, this gives 1.348 mm as total length. The siphunculi are described as being 0.14 mm long, $1^5/_9$ times as long as the knobbed cauda. But the most striking fact is that the processus is said to be $1^1/_9$ times as long as the base of VIth segment. There is no American *Chaitophorus* known in which alatae have such a comparatively short processus terminalis and at the same time a knobbed cauda. But his fig. 47 shows a different length of processus terminalis, nearly as long as IIIrd segment and not ¼ of its length as the measurements suggest. Therefore one may assume printer's errors to be present in the measurements. Such errors are very numerous in the second part of the paper, published in 1906.

SANBORN gives the number of rhinaria as 15—20 on IIIrd segment and according to his fig. 47a they are irregularly spread along one side. This clearly suggests that his aphid was the one hitherto known as *Ch. populifoliae* Fitch, Oestlund or Davis.

BAKER's sample from Connecticut of which I received a slide from Dr. SIMPSON consists of a mixture of this species and *Ch. populifolii* (Essig), most of the alatae being *stevensis* Sanborn. BAKER applied the name *viminalis* incorrectly, as discussed under that species.

This aphid appears to be widely spread over North America, occurring on many *Populus* species. Its fore tibiae and to some extent also the other tibiae are, particularly in alatae, rather conspicuously spinulosely imbricated.

In alatae the 10—26 rhinaria are usually irregularly placed along one side of IIIrd segment and only very rarely in a more or less single, straight row; the IVth segment generally has some, up to 7 rhinaria, the Vth segment rarely up to 4; on the abdomen the thickness of the transverse bands increases caudad, and therefore the anterior segments usually have narrow bands, or sometimes hardly any bands, while those on the next 3—4 tergites are much wider and sometimes coalesce to an intersegmentally perforated sclerotic patch. Apterous females can often only with great difficulty be separated from very pale specimens of *populifolii* Essig which is unpleasant, as these two species occur in mixed colonies.

Material available: cotypes of *Ch. delicata* Patch, kindly sent by Dr. G. W. Simpson, and other samples from Maine, Connecticut, Minnesota, Colorado, Utah and Wisconsin; New Brunswick and Quebec (Canada).

Chaitophorus utahensis (Knowlton, 1928)

This species was originally described as a *Neothomasia*, with the genotype of which it agrees morphologically; even the veins of the wings are rather conspicuously bordered. Palmer (1952) suggests that *salicicorticis* Essig and *utahensis* are only varieties of *macrostachyae* Essig, but this is incorrect. As mixed samples occur, distinguishing the species with the characters indicated by Palmer is not easy and indeed, in some of the slides identified by Professor Palmer as *macrostachyae* that are available, I found *utahensis* Knowlton.

Apart from the characteristic difference in length and hairiness of the base of the last ant. segment used in my key, there are several other differences. In *macrostachyae*, etc., as well as in *utahensis* the rostrum is retractile, but when the rostrum is pulled out to its full length, it reaches to or past the siphunculi in *macrostachyae*, but only to the 2nd abd. segment in *utahensis*. In *utahensis* the primary (= thickest) hairs on the anterior abd. tergites are blunt, acuminate or furcated at apex, but in *macrostachyae*, etc., all hairs have acute apices. *Ch. utahensis* has no hairs on the base of the siphunculi, *Ch. macrostachyae* (Essig), *Ch. salicicorticis* (Essig) and *Ch. utahensis* (Knowlton) agree in the reticulation of the integumentum and in the fact that in apterae the VIIth abd. tergite is nearly always more or less completely fused with the shield covering the Ist (or IInd or IIIrd) to VIth abd. segment.

Of this species more samples are available than of other American *Chaitophorus*, all from *Salix*. Apart from cotypes I have material from Idaho (Boise, Parina) and Utah (Axtell, Beaver, Central, Clear Creek Canyon, Draper, Ephraim, Elsinore, Huntsville, Joseph, Mantua, Monrow, Panguitch, Redmond, Richfield, Salina, Salt Lake City, Santa Clara, and Sigurd) all collected by Professor G. F. Knowlton from the bark of twigs. In Utah it seems to be the most common *Chaitophorus*. Material from Fort Collins, Colorado, identified as *Periphyllus macrostachyae* by Professor Palmer could also be examined.

Chaitophorus versicolor Koch, 1854

To my knowledge this species, which in Europe is the most common *Chaitophorus* species on *Populus nigra* and its hybrids with North American *Populus*

spp., has not yet been recorded from North America. When Professor LANGE from California sent me galls of *Pemphigus bursarius* L. from *Populus nigra* var. *italica*, I found in the partly opened galls 6 damaged apterae of *Chaitophorus versicolor* Koch which also in Europe is common on Lombardy poplar. Later Mrs. MACGILLIVRAY sent her *Chaitophorus* and among those I found a sample from *Populus canadensis,* a tree which also in Europe becomes heavily infested.

It has evidently been introduced into North America with Lombardy poplar which is only propagated by cuttings.

The species strikingly resembles *Ch. populifolii* (Essig) subsp. *neglectus* Hottes & Frison and *simpsoni* subsp. nov., for which it will often be mistaken in North America. However, apterous viviparous females can be recognized by their siphunculi being dark instead of pale, by the hairs on IIIrd ant. segment being up to about 3 times as long as the segment's diameter, or longer, and by the hairiness of the last rostral segment which has always more than 11 hairs, usually 14—23. In alatae there are about 9—15 rhinaria on IIIrd ant. segment, irregularly placed; the siphunculi are black, much darker than the dorsal bars on abdomen; the hind tibiae are also darkened; ventrally the abdomen generally has black transverse striae. In Europe the males have been recorded as being alate or apterous, but this probably is mainly through confusion with other species. So far I have seen only alate males in this species. Fundatrices in this species are evenly pale green with pale siphunculi and very different from the summer generations.

Like *Ch. populifolii* (Essig) the aphids live on the young shoots and leaves in early summer, later on both upper and under side of leaves, with a certain preference for galls formed by *Thecabius* and *Pemphigus* which they enter in later summer. Ants are usually present.

Material available: From North America: from Lombardy poplar, *Populus nigra* var. *italica,* Centerville, California, 11.VI.1957, leg. W. H. LANGE; from *Populus canadensis,* Fredericton, New Brunswick (Canada), 30.VII.1958, leg. G. B. ANDERSON & M. E. MACGILLIVRAY.

Chaitophorus viminalis Monell, 1879

In studying samples from North America identified by American specialists as *Chaitophorus viminalis* Monell it became evident that there has been considerable confusion about this species. MONELL's type was not available but as he describes the species from *Salix lucida* and weeping willow, *S. babylonica,* I presume, in view of the specific name, that the specimens from weeping willow are typical. According to his description it is a pale green to light yellow aphid with two often obsolete darker vittae on the abdomen; it is said to have long, white hairs. This description fits a *Chaitophorus* that occurs from Utah to Minnesota on weeping willow, sometimes intermingled with *Ch. nigrae* Oestl.

The following misidentifications should be mentioned.

BAKER (1917, 1923) records *Ch. viminalis* from Connecticut. This sample, collected on *Populus*, was made available by Dr. SIMPSON. On remounting it appeared to consist of alatae of *Ch. stevensis* Sanborn and apterae of *Ch. populifolii* (Essig). Many slides from various states from *Salix*, identified as *Ch. viminalis* Monell consisted of *Ch. nigrae* Oestl. A slide from Minnesota from *Salix baby-*

lonica (probably collected by Oestlund) identified as *Ch. viminalis* was correctly identified, but held one alata of *Ch. nigrae* Oestl. A slide from Colorado, from *Salix*, identified by Gillette as *Ch. populifolii* consisted of *Ch. viminalis*.

Ch. viminalis is mostly pale when cleared, but sometimes a pigmentation may develop which, however vague and asymmetrical it usually is, resembles that of *Ch. nigrae* Oestl. Yet confusion is hardly possible. For whereas *Ch. nigrae* shows a distinct reticulation, *Ch. viminalis* has a pattern of rather dispersed, hardly or not pointed nodules. The cauda is markedly knobbed with an almost globular or faintly elongated, small knob. The hairs on IIIrd ant. segment are on the inner side very much longer than those on the outer side. The rostrum is very short, just reaching the middle coxae (much longer in *nigrae*) and the last segment is obtuse, up to 0.09 mm long and only about $^7/_9$ or less of the 2nd joint of the hind tarsi. The first tarsal joints show 7 hairs. In alatae the abdomen shows a large, hardly perforated, though sometimes intersegmentally paler dorsal patch but sometimes also the mutually usually free black bands occurring in *Ch. nigrae* Oestl.

Probably even more willow aphids have been mistaken for *Ch. viminalis* Monell, but the characters mentioned above should make separation possible. For the resemblance to *Chaitophorus pussillus* Hottes & Frison, vide p. 20.

Available from various states.

Chaitophorus viminicola spec. nov.

Body rather elongated oval, about 1.94—2.02 mm long with 1.02 mm as maximum width, blackish pigmented with a vague paler median stripe from pronotum to about IIIrd abd. tergite; tergites I—VI fused. Tergum with irregularly placed blunt nodules. In the available sample dorsal hairs with fine, acute apices, exceedingly long with the spinal hairs on IInd abd. tergite up to 0.22 mm, 7 times basal diameter of IIIrd ant. segment. Antennae rather long, with IIIrd segment pale yellow except at apex, the rest dark brown. Antennal hairs rather numerous, fine, not stiff; on IIIrd segment those on inner side to $3^1/_2$ times basal diameter of the segment, the few hairs on outer side to $2^1/_2$ times that diameter; longest hair on VIth segment nearly as long as basal portion of the segment measured to the proximal rim of the rhinaria. Rostrum not reaching the hind coxae; last segment rather slender, about as long as 2nd joint of hind tarsi, with 10 or more hairs; one of the subapical pairs of hairs rather far basad. Siphunculi rather thin, nearly as dark as the dorsal shield, placed on a small colourless membraneous area. Cauda slightly dark, very distinctly knobbed. Legs with the fore femora yellowish brown, the middle and hind femora very dark, darker than the dorsal shield; all the tibiae with dark bases, brownish yellow with slightly darkened apices, not imbricated; first tarsal joints with 5 hairs.

Colour in life not known, but probably blackish.

Alate viviparous female.

Head and thorax black sclerotic, abdomen with equally thick, mutually free black bars on all tergites, with rather small black marginal sclerites and intersegmental dots. Longest spinal hairs on IInd abd. tergite about 0.17 mm long. An-

tennae about $^6/_7$ length of body, with very dark basal segments, flagellum dark brownish with only the base of IIIrd segment pale; IIIrd segment nearly smooth, with 10—14 rhinaria irregularly placed along one side; IVth segment without rhinaria; processus terminalis about 4 times base of VIth segment, longer than IIIrd segment. Other characters as in apterae viviparae.

Colour in life unknown.

This interesting species was received a few times, identified as *Ch. viminalis* Monell or *Ch. nigrae* Oestl., but it differs considerably from both species.

The last rostral segment, though more hairy, resembles that in *nigrae*, but in contrast the processus terminalis is very long and the dorsum has quite flat "ring"-like nodules in apterae. The blunt rostral segment in *viminalis* is quite different, and also the chaetotaxy of the first tarsal joints differs.

The nearest related species probably is *Ch. longipes* Tissot, which differs almost only in having the hairs blunt or furcated and much shorter.

Material available: 3 apterae viviparae and 5 alatae from *Salix* sp., State College, Pennsylvania, 16.VIII.1942, leg. J. O. PEPPER; one alata from *Salix* sp., Ames, Iowa, 1.VII.1924, leg. F. C. HOTTES; the record of *Chaitophorus viminalis* Monell from Metropolis, Illinois, 1.VI.1928 in HOTTES & FRISON (1931) relates at least partly to *Ch. viminicola* spec. nov. according to a slide in the British Museum (Nat. Hist.), London, where also a slide from Le Roy, Illinois, 9.VII.1907 is present in the THEOBALD collection.

SPECIES NOT DISCUSSED

1. *Aphis candicans* Thomas, 1877. A nomen nudum turning up in some lists (HUNTER, 1901; WILSON & VICKERY, 1918; PATCH, 1938) as *Chaitophorus candicans* Thomas.

2. *Chaitophorus salicis* Williams, 1891. A nomen nudum occurring in WILLIAMS' list and in the introduction of his 1911 paper.

3. *Chaitophorus agropyrensis* Gillette, 1911. Belongs in the genus *Sipha* Passerini, 1860.

4. *Chaitophorus flabellus* Sanborn, 1904. Belongs in the genus *Iziphya* Nevsky, 1929.

5. *Chaitophorus artemisiae* Gillette, 1911. Belongs in the genus *Microsiphoniella* Hille Ris Lambers, 1947.

6. *Chaitophorus spinosus* Oestlund, 1886. Belongs in the genus *Hoplochaitophorus* Granovsky, 1933.

7. *Chaitophorus tridentatae* Wilson, 1915. Belongs in the genus *Flabellomicrosiphum* Gillette & Palmer, 1932.

BIBLIOGRAPHY

BAKER, A. C., 1917. Eastern aphids, new or little known, part II. Journ. Econ. Entom., vol. 10, p. 420—433.

BAKER, A. C., 1920. Generic classification of the Hemipterous family Aphididae. U.S. Dept. Agric. Bull., no. 826, p. 1—109.

BAKER, A. C., 1923. Subfamily Aphidinae-tribe Callipterini. In Connecticut Geol. Nat. Hist. Survey Bull. no. 34, p. 271—290.

BÖRNER, C., 1931. Mitteilungen über Blattläuse. Anz. f. Schädlingsk., vol. 8, p. 28—30.

BÖRNER, C., 1949. Kleine Beiträge zur Monographie der europäischen Blattläuse. Beitr. z. taxon. Zool., vol. 1, p. 44—62.

Börner, C., 1952. Europae centralis aphides, die Blattläuse Mitteleuropas; Namen, Synonyme, Wirtspflanzen, Generationszyklen. Mitt. thürung. bot. Ges., Beiheft 3, p. 1—259.

Börner, C. & Heinze, K., 1957. Aphidina-Aphidoidea, Blattläuse, plantlice (aphids), pucerons (aphides). Sorauer, Handb. d. Pflanzenkr., ed. 5, vol. 5, livr. 4, p. 1—402.

Boudreaux, H. B., 1951. The insect family Aphididae in Louisiana. Proc. Louisiana Acad. Sciences, vol. 14, p. 14—22.

Davis, J. J., 1910. A list of the Aphididae of Illinois, with notes on some of the species. Journ. Econ. Entom., vol. 3, p. 482—498.

Davis, J. J., 1912. Williams' "The Aphididae of Nebraska", a critical review. Univ. Studies Nebraska, vol. 11, p. 253—296.

Essig, E. O., 1911. Aphididae of Southern California. Pomona College Journ. Entom., vol. 3, p. 523—557.

Essig, E. O., 1912. Aphididae of Southern California. Pomona College Journ. Entom., vol. 4, p. 698—745.

Gerstaecker, C. E. A., 1856. Bericht über die wissenschaftlichen Leistungen im Gebiete der Entomologie. Arch. f. Naturgesch. für 1854, p. 1—202.

Gillette, C. P. & Palmer, M. A., 1931. The Aphididae of Colorado. Part. I. Ann. Ent. Soc. America, vol. 24, p. 827—934.

Goot, P. v. d., 1913. Zur Systematik der Aphiden. Tijdschr. v. Entom., vol. 56, p. 69—154.

Hille Ris Lambers, D., 1947. Notes on the genus Periphyllus v. d. Hoeven (Hom., Aph.). Tijdschr. v. Entom., vol. 88, p. 225—242.

Hille Ris Lambers, D., 1958. Remounting aphids from balsam slides. Temminckia, vol. 10, p. 6—7.

Hottes, F. C., 1926. Two new species of Aphididae from Minnesota. Proc. Biol. Soc., Washington, vol. 39, p. 111—114.

Hottes, F. C. & Frison, T. H., 1931. The Plant Lice, or Aphididae of Illinois. Ill. Nat. Survey Bull., vol. 19, p. 121—447.

Knwolton, G. F., 1927. A new willow aphid from Utah. Pan-pacific Entom., vol. 3, p. 199.

Knowlton, G. F., 1928. Notes on a few species of Neothomasia from Utah (Homop.-Aphididae). Entom. News Philadelphia, vol. 39, p. 233—235.

Koch, C. L., 1854. Die Pflanzenläuse Aphiden getreu nach dem Leben abgebildet und beschrieben. Nürnberg. Livr. 1, p. 1—134.

Monell, J., 1879. Notes on Aphidinae with descriptions of new species. Bull. U.S. Geol. Geogr. Survey Territories, vol. 5, p. 18—32.

Oestlund, O. W., 1886. List of the Aphididae of Minnesota, with descriptions of some new species. 14th Ann. Rept. State Geol. Minnesota, p. 17—54.

Oestlund, O. W., 1887. Synopsis of the Aphididae of Minnesota. Geol. Nat. Hist. Surv. Minnesota, Bull. no. 4, p. 1—100.

Oestlund, O. W., 1922. A synoptical key to the Aphididae of Minnesota. 19th Rept. State Entom. Minnesota, p. 114—151.

Palmer, M. A., 1952. Aphids of the Rocky Mountain region. Thomas Say Foundation, vol. 5, p. 1—452.

Passerini, G., 1860. Gli Afidi, con un prospetto dei generi ed alcune specie nuove italiane. Parma, p. 1—40.

Patch, E. M., 1938. Food-plant Catalogue of the Aphids of the World. Maine Agric. Exp. St. Bull. no. 393, p. 35—431.

Sanborn, C. E., 1904. Kansas Aphididae. Kansas Univ. Scient. Bull., vol. 3, p. 1—82.

Strand, E., 1917. Uebersicht der in Gistel's „Achthundert und zwanzig neue oder unbeschriebene wirbellose Tiere" (1857) behandelten Insekten. Arch. f. Naturgesch., vol. 82, A 5, p. 75—101.

Swain, A. F., 1919. A synopsis of the Aphididae of California. Univ. Cal. Publ. Ent., vol. 3, p. 1—199.

Thomas, C. A., 1878. A list of the species of the tribe Aphidini, family Aphidae, found in the United States, which have been heretofore named, with descriptions of some new species. Nat. Hist. Illinois, Bull. no. 2, p. 3—16.

TISSOT, A. N., 1932. Six new aphids from Florida, with description of several forms of another species. Florida Entom., vol. 16, p. 1—13.

WALKER, F., 1870. Notes on Aphides. Zoologist, 2nd series, vol. 5, p. 1996—2001.

WILLIAMS, T. A., 1911. The Aphididae of Nebraska. Univ. Studies Nebraska, vol. 10, p. 85—175.

WILSON, H. F., 1910. A second paper on the genera in the subfamily Callipterinae. Canad. Entom., vol. 42, p. 384—388.